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3 1. A method of processing original-quality MPEG coded video to produce reduced-

4 quality MPEG coded video for trick mode operation, the MPEG coded video including a

set of non-zero AC discrete cosine transform (DCT) coefficients for 8x8 blocks in I-

frames of the MPEG coded video, said method including the steps of removing non-zero

AC DCT coefficients from the 8x8 blocks of I-frames of the MPEG coded video to

produce I-frames of reduced-quality MPEG coded video, and inserting freeze frames in

9 the reduced-quality MPEG coded video.

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2. The method as claimed in claim 1, which further includes ingesting the original-

quality MPEG coded video into a file server and storing the original-quality MPEG

coded video in a main file, producing the I-frames of reduced-quality MPEG coded video

from the original-quality MPEG coded video ingested into the file server, and storing the

I-frames of reduced-quality MPEG video in at least one trick mode file in the file server.

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3. The method as claimed in claim 2, wherein the trick mode file shares a volume

with the main file, and the volume includes an index linking the I frames of reduced-

quality MPEG coded video to corresponding I frames in the original-quality MPEG

coded video.

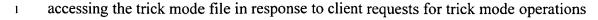
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4. The method as claimed in claim 3, which includes permitting clients to access the

main file but not the trick mode file via read and write file access commands, and

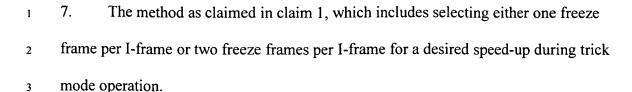


during streaming of the original-quality MPEG coded video from the main file.

file and an MPEG coded video stream from the trick mode file.

5. The method as claimed in claim 2, which includes responding to a client video access request by seamless splicing between an MPEG coded video stream from the main

6. The method as claimed in claim 1, which further includes ingesting the original-quality MPEG coded video into a file server and storing the original-quality MPEG coded video from the original-quality MPEG coded video ingested into the file server, storing a first copy of the I-frames of reduced-quality MPEG coded video in a fast-forward trick mode file, and storing a second copy of the I-frames of reduced-quality MPEG coded video in a fast-reverse trick mode file, the fast-forward trick mode file including a first sequence of the I-frames of reduced-quality MPEG video in a forward order for streaming MPEG coded video from the fast-forward trick mode file as the fast-forward trick mode file is read for a fast-forward presentation of the MPEG coded video, and the fast-reverse trick mode file including a second sequence of the I-frames of reduced-quality MPEG video in a reverse order for streaming MPEG coded video from the fast-reverse trick mode file as the fast-reverse trick mode file is read for a fast-reverse trick mode file as

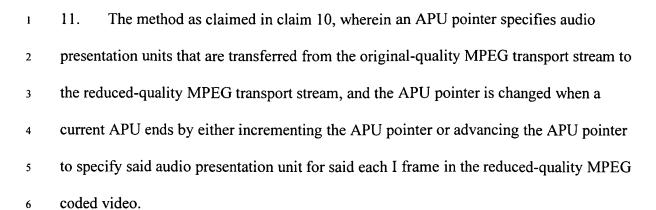


The method as claimed in claim 1, wherein no more than about nine AC DCT coefficients per 8x8 block are retained in the I-frames of reduced-quality MPEG coded video.

9. The method as claimed in claim 1, wherein the original-quality MPEG coded video is included in an original-quality MPEG transport stream, and the method includes producing an MPEG trick-mode transport stream including the reduced-quality MPEG coded video and the freeze frames inserted into the reduced-quality MPEG coded video.

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10. The method as claimed in claim 9, which further includes extracting from the original-quality MPEG transport stream an audio presentation unit for each I frame in the reduced-quality MPEG coded video, the audio presentation unit having, in the original-quality MPEG transport stream, an audio presentation time that first begins in a video presentation time of a corresponding I frame in the original-quality MPEG transport stream, and inserting the audio presentation unit into the reduced-quality MPEG transport stream so that, in the reduced-quality MPEG transport stream, the audio presentation unit has an audio presentation time that first begins in a video presentation time of said each I frame.



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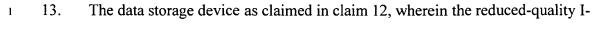
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12. A data storage device containing a main file, a fast-forward file and a fast-reverse file, the main file containing data of an MPEG transport stream including groups of pictures (GOPs), each GOP including an original-quality I-frame and a plurality of P or B-frames, the fast-forward file containing data of a fast-forward MPEG transport stream including GOPs, each GOP in the fast-forward file corresponding to a GOP in the main file and including at least one reduced-quality I frame corresponding to the originalquality I frame in the corresponding GOP of the main file, the fast-reverse file containing data of a fast-reverse MPEG transport stream including GOPs, each GOP in the fastreverse file corresponding to a GOP in the main file and including at least one reducedquality I-frame corresponding to the original-quality I frame in the corresponding GOP of the main file, wherein a reading of the main file produces an MPEG transport stream for an audio-visual presentation at a normal rate, a reading of the fast-forward file produces an MPEG transport stream of the audio-visual presentation in a forward direction at a fast rate, and a reading of the fast-reverse file produces an MPEG transport stream of the audio-visual presentation in a reverse direction at a fast rate.



- frames in the fast-reverse file are copies of the reduced-quality I-frames in the fast-
- 3 forward file.

- 5 14. The data storage device as claimed in claim 12, wherein each GOP in the fast-
- forward file and the fast-reverse file includes at least one freeze frame.

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- The data storage device as claimed in claim 12, wherein each I frame in the main file, in the fast-forward file, and in the fast-reverse file, includes a plurality of 8x8 blocks,
- the 8x8 blocks each having a variable number of non-zero AC discrete cosine transform
- (DCT) coefficients, the non-zero AC DCT coefficients of each 8x8 block in an I frame of
- the fast-forward file and of the fast-reverse file also appear in a corresponding 8x8 block
- of a corresponding I frame of the main file, and wherein a limited number of the non-zero
- ACT DCT coefficients in the 8x8 blocks of the I frames in the main file appear in the
- corresponding 8x8 blocks of the corresponding I frames in the fast-forward file and the
- fast-reverse file.

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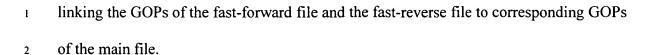
16. The data storage device as claimed in claim 15, wherein no more than about nine

AC DCT coefficients per 8x8 block are included in the I-frames of the fast-forward file

and the fast-reverse file.

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The data storage device as claimed in claim 12, wherein the fast-forward file and the fast-reverse file share a volume with the main file, and the volume includes an index



The data storage device as claimed in claim 17, wherein the volume further includes an inode area and a meta-data area.

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19. A file server including at least one data storage device, the data storage device containing a main file, a fast-forward file and a fast-reverse file, the main file containing data of an MPEG transport stream including groups of pictures (GOPs), each GOP including an original-quality I-frame and a plurality of P or B-frames, the fast-forward file containing data of a fast-forward MPEG transport stream including GOPs, each GOP in the fast-forward file corresponding to a GOP in the main file and including at least one reduced-quality I frame corresponding to the original-quality I frame in the corresponding GOP of the main file, the fast-reverse file containing data of a fast-reverse MPEG transport stream including GOPs, each GOP in the fast-reverse file corresponding to a GOP in the main file and including at least one reduced-quality I-frame corresponding to the original-quality I frame in the corresponding GOP of the main file, wherein the file server is programmed to respond to a client request for an audiovisual presentation at a normal rate by reading the main file and streaming MPEG data from the main file to the client, wherein the file server is programmed to respond to a client request for the audiovisual presentation in a forward direction at a fast rate by reading the fast-forward file

and streaming MPEG data from the fast-forward file to the client, and

i	wherein the file server is programmed to respond to a client request for the audio
2	visual presentation in a reverse order at a fast rate by reading the fast-reverse file and
3	streaming MPEG data from the fast-reverse file to the client.
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5	20. The file server as claimed in claim 19, wherein the file server is programmed to
6	seamlessly splice between the streaming of MPEG data from the main file to the client
7	and the streaming of the MPEG data from the fast-forward file to the client.
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9	21. The file server as claimed in claim 19, wherein the file server is programmed to
10	seamlessly splice between the streaming of MPEG data from the main file to the client
11	and the streaming of the MPEG data from the fast-reverse file to the client.
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13	The file server as claimed in claim 19, wherein the file server is programmed to
14	allocate a volume for the main file, the fast-forward file, and the fast-reverse file when
15	the main file is ingested into the file server.
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17	23. The file server as claimed in claim 22, wherein the volume further includes an
18	index linking the GOPs of the fast-forward file and the fast-reverse file to corresponding
19	GOPs of the main file.
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21	24. The file server as claimed in claim 22, wherein the volume further includes an
22	inode area and a meta-data area.



- 1 25. The file server as claimed in claim 22, wherein the file server is programmed to
- produce the fast-forward file and the fast-reverse file from the main file ingested during
- 3 the copy-in operation.

- 5 26. The file server as claimed in claim 19, wherein the file server is further
- 6 programmed to permit clients to access the main file but neither the fast-forward file nor
- the fast-reverse file via read and write file access commands.